

in control methods are being developed constantly at the Bureau's western experiment stations under the direction of Dr. A. D. Hopkins. These improvements mean cheaper protection and the investigative work which yields them should not be sacrificed. There is a real need for the study of forest insect problems by the state experiment stations. With the rapidly growing demand by the forest industry for advice on forest insect control, the necessity for the enlargement of the Bureau's personnel of forest entomologists and the need for the attention of the state experiment stations to the many still unsettled phases of the forest insect problem are already at hand.

BIOLOGICAL NOTES ON DESMOCERUS, A GENUS OF ROUNDHEAD BORERS, THE SPECIES OF WHICH INFEST VARIOUS ELDERS

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The Genus *Desmocerus* consists of four western and one eastern species. All bore in the pith and wood of living shrubs or trees of various species of elder (*Sambucus*). As some of the elders are used as ornamental shrubs or shade trees these insects which infest them are of interest as shade tree pests. Usually the stems mined by the borers do not die but sometimes they do and in any case the emergence holes made by the beetle cause unsightly scars in the bark and afford an easy entrance to wood destroying bacteria, fungi and ants.

In general the life cycle of *Desmocerus* is two years. Eggs are laid in crevices of the bark or around wounds and the larva does most of its boring in the pith of the stems. Lateral mines are made through the wood to the surface of the bark for throwing out borings and for the emergence of the adult. Pupation and the transformation to the adult take place during the second spring in a cell in the pith. The adults emerge about the time the elder is in bloom and may be found on the flowers or foliage. The best method of collecting them, however, is to cut into the stems just before the flowers open and take them from the pupal cells.

All of the species have been collected and studied to some extent by the writer. Special attention has been given to *cribripennis* and *californicus* because they occur in the Pacific region and because *californicus* causes damage to the blue berried elder which is a common dooryard shade tree in central California. Mr. R. D. Hartman of the Los Gatos Forest Insect Laboratory made a number of notes on the life history of *californicus* and Miss E. T. Armstrong of the Washington office collected most of the *auripennis* studied.

D. palliatus Forst.—Eastern states; both males and females blue except for basal third of elytra which is yellow; larva mines stems of common eastern elder (*Sambucus canadensis*); does not always kill the stem mined. At Brookland, D. C. a large larva was found in the pith at the base of a large stem on February 19, 1910, and an adult in a pupal cell in a similar position on May 19, 1913.

D. cribripennis Horn.—Washington, Oregon, California; both males and females dark green above, elytra with narrow orange margins; larva mines stems of the western red-berried elder (*S. callicarpa*), usually does not kill the stems mined; eggs are laid in crevices in the bark. The young larva upon hatching mines through the wood into the pith and up the pith until full grown. At irregular intervals lateral mines are made from the pith through the wood to the surface for throwing out borings, etc. When growth is completed the larva mines through the wood to the surface and then retreats back into the pith plugging the mine as it goes with shredded borings. After pupation and transformation take place the adult emerges through this mine. At Pialschie, King Co., Wash., pupation takes place in the spring and the adults emerge during April and May. Sometimes the young larvae will eat a large hole in the outer wood before entering the pith. Several larvae may live in one stem. The life cycle is two years.

D. californicus Horn.—California; male elytra bluish or purplish with distinct orange margins, female elytra velvety black or slaty with slight orange margins; larva mines stems of the blue berried elder (*S. glauca*) at lower elevations in the central coast regions of California; usually does not kill the stems mined; the adult feeds on the foliage. Common around Los Gatos, Palo Alto and Guadalupe in Santa Clara County. Egg is 3.5mm. long, 1.25mm. in dia., white when first laid, turning to brownish white and reddish brown; oblong, pointed at both ends, points terminating in knobs; surface marked by heavy, longitudinal wavy ridges which do not always extend from end to end, connected by lighter transverse ridges which are more prominent toward the ends; surface between ridges marked by large pits.

The eggs are laid in the crevices of the bark, tucked under the bark at scars or in the wood where small branches have been broken off. They are fastened on with a shellac like substance. Upon hatching the larva enters the bark near the shell or wanders for some distance before entering. Usually it mines through wood and into the pith as soon as possible but sometimes when in large trunks it remains in the wood until growth is completed. As the mine proceeds the larva makes lateral mines to the surface at irregular intervals for the purpose of throwing out

borings and other debris. When growth is completed the larva bores out to the surface, retreats for several inches, plugging the mine with shredded borings and forming a pupal cell in the pith. The larval stage lasts for about two years. Pupation takes place from January to April. The pupal stage lasts for about one month and the young adult remains in the cell for several weeks before emerging. The first adult was found in the pupal cell on February 20 and in the field on April 12th. The egg stage lasts from thirty to forty days. In the laboratory the female lays from eight to twenty eggs. The last beetle collected in the field was taken on May 19th.

D. piperi Webb.—Idaho, Washington, Oregon; male elytra entirely orange, female elytra bluish green with narrow orange margins, smaller species, 15 to 20mm. long; mines stems of black berried elder (*S. melanocarpa*). At Bourne, Baker County, Oregon, on June 29, 1910, males and females were common on the foliage of shrubs which had just blossomed. Many pairs were copulating.

D. auripennis Chev.—California; male elytra entirely orange, female elytra with broad orange margins but always with a darker blue green or purple discal area which may vary in size from a mere spot to one half the area of the elytra; larger species, 23 to 28 mm. long; mines stems of the blue berried elder (*S. glauca*) at higher elevations in the Sierras. Medium and large larvae were taken in the pith of the bases of stems of bushes near Ellis Meadows, Sierra National Forest, on May 16, 1921, at an elevation of about 5500 feet. One of the large larva pupated May 31 but failed to transform. Adults were taken in numbers on the flowers and foliage during July and August, 1914 and 1915, along the Lincoln Highway in El Dorado County, at an elevation of from 5000 to 5500 feet. Plants at lower elevations did not appear to be infested. The life cycle is two years, half grown larvae being found in July.

In case of damage the trunks of the trees to be protected should be sprayed the first of June with the Craighead arsenate of lead-miscible oil emulsion or some other good ovicide.